

Association of Flavored Nicotine Salt Pod System Use and Subsequent Switching Behavior

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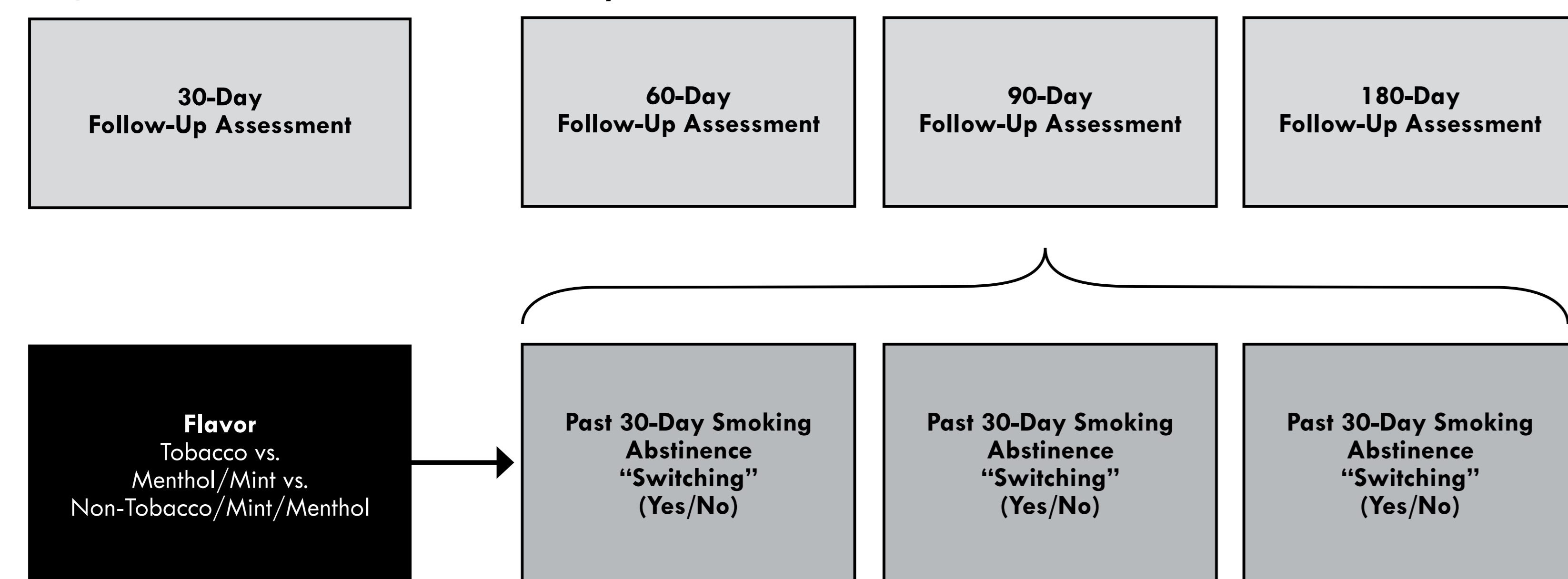
Significance:

- Evidence suggests that use of electronic nicotine delivery systems (ENDS) in non-tobacco flavorings may be associated with combustible cigarette smoking reduction and abstinence among adult smokers and that flavor may be a key product feature that distinguishes ENDS from combustible cigarettes
- Nicotine salt pod system (NSPS) utilizes protonated nicotine formulations to more closely approximate the nicotine delivery of combustible cigarettes
- NSPS is available in six non-tobacco flavors (i.e., mint, menthol, fruit, cucumber, creme, mango) and two tobacco flavors
- Accordingly, adult smokers who use NSPS in tobacco flavors may differ from those who use non-tobacco flavors
- However, there is little prospective longitudinal evidence of whether use of NSPS in non-tobacco (vs. tobacco) flavors among adult smokers is associated with increased likelihood of successful smoking cessation
- This study examined whether: (1) Adult smokers who use NSPS in non-tobacco flavors differ from those who use tobacco-flavored NSPS; and (2) If use of NSPS in non-tobacco vs. tobacco flavors is prospectively associated with past 30-day combustible cigarette smoking abstinence ("switching")

Methods:

- Adult past 30-day smokers who purchased a JUUL starter kit in a retail store or online (N=19,595) completed 30-day, 60-day, 90-day and 180-day follow-up assessments
- At the 30-day assessment participants reported the JUUL flavor they used most often in the past 30 days: (1) tobacco flavor; (2) mint/menthol; (3) non-tobacco/mint/menthol flavors (NTM)
- At the three subsequent assessments participants reported if they had smoked in the past 30-days (yes/no)
- Preliminary analyses assessed differences in demographic and smoking characteristics by NSPS flavor
- Repeated-measure logistic regression models analyzed the association between primary NSPS flavor and likelihood of switching from smoking to JUUL at the 60-day, 90-day and 180-day assessments

Figure 1. Statistical Analysis



Note. In the General Estimating Equation (GEE) model JUUL flavor at 30-day assessment was the regressor variable and switching pooled across 60-day assessment, 90-day assessment and 180-day follow-ups was the outcome.

Results:

- At the 30-day follow-up, 15.2% of participants primarily used tobacco flavors, 31.3% used mint/menthol and 53.5% used NTM flavors
- Participants who used Tobacco flavors, compared to Mint/Menthol and NTM flavors, respectively, were, on average, older (Mean age = 35.7 vs. 30.3 vs. 31.5), more likely to be male (59.7% vs. 54.8% vs. 55.1%; $p < 0.001$) and white (85.5% vs. 81.8% vs. 83.9%), smoke more days out of the past 30-days (18.4 vs. 15.8 vs. 16.6), smoke more cigarettes/day (8.5 vs. 6.5 vs. 7.01; all $ps < 0.001$)
- After adjustment for demographic and smoking covariates, use of NSPS in Mint/Menthol (OR[95%CI]=1.23[1.11, 1.36]) and NTM flavors (OR[95%CI]= 1.18[1.08, 1.30]), compared to tobacco flavors, were significantly associated with switching pooled across follow-up

Table 2. Associations between NSPS flavor at 30-day follow-up and Switching across 60-day, 90-day and 180-day follow-up

Regressor	OR Unadjusted (95% CI)	OR Adjusted ^a (95% CI)
Tobacco	1.0 (Ref)	1.0 (Ref)
Menthol/Mint	1.53 (1.42, 1.66) [†]	1.23 (1.11, 1.36) [†]
Non-Tobacco/Mint/Menthol	1.43 (1.33, 1.53) [†]	1.18 (1.08, 1.30)**

Note. N=19,595 Participants; 46,208 Observations. In the General Estimating Equation (GEE) model JUUL flavor at 30-day assessment was the regressor variable and switching pooled across 60-day assessment, 90-day assessment and 180-day follow-ups was the outcome. ^aAdjusted for Age, Sex, Race/Ethnicity, Income, Education level, Years regular smoker, Age started smoking regularly, Cigarette dependence at baseline, Cigarettes smoked/day at 30-day follow-up, Days smoked in last month at 30-day follow-up. [†] $p < 0.05$, ^{**} $p < 0.01$, ^{††} $p < 0.001$.

Conclusions:

- Adult smokers who used NSPS in tobacco flavors (vs. mint/menthol and NTM flavors) were on average, older, more likely to be male, more likely to be white, reported greater nicotine dependence at baseline and greater frequency and intensity of smoking at 30-day follow-up
- After controlling for these interindividual differences, use of NSPS in mint/menthol and NTM flavors were still associated with higher rates of switching across the follow-up period
- Flavor may be an important NSPS product characteristic that could influence switching behavior among adult smokers

Table 1. Sample Descriptive Characteristics

Sociodemographics	Tobacco (N=2977)	Mint/Menthol (N=6129)	Non-Tobacco/Mint/Menthol (N=10489)	Total (N=19595)	Difference (p)
Age, M (SD)	35.73 (11.87)	30.31 (10.43)	31.07 (10.03)	31.54 (10.61)	<0.001
Sex					<0.001
Female	1179 (39.90)	2707 (44.50)	4622 (44.40)	8508 (43.80)	
Male	1762 (59.70)	3332 (54.80)	5735 (55.10)	10829 (55.70)	
Transgender	11 (0.40)	42 (0.70)	54 (0.50)	107 (0.60)	
Race/Ethnicity					<0.001
Hispanic	47 (1.60)	146 (2.50)	182 (1.80)	375 (2.00)	
African American	68 (2.40)	274 (4.60)	420 (4.20)	762 (4.00)	
White	2443 (85.50)	4821 (81.80)	8485 (83.90)	15749 (83.50)	
American Indian	58 (2.00)	144 (2.40)	264 (2.60)	466 (2.50)	
Asian	225 (7.90)	457 (7.80)	692 (6.80)	1374 (7.30)	
Pacific Islander	16 (0.60)	52 (0.90)	74 (0.70)	142 (0.80)	<0.001
College graduate (vs. less education)	1290 (46.40)	2239 (39.60)	3832 (39.30)	7361 (40.50)	<0.001
Income > \$50,000 (vs. less income)	1344 (52.30)	2334 (44.50)	3902 (43.10)	7580 (44.90)	0.001
Baseline Smoking Characteristics					
Years regular smoker, yr, M (SD)	16.54 (12.05)	11.38 (10.09)	12.08 (9.99)	12.63 (10.55)	<0.001
Age started smoking regularly, yr, M (SD)	18.04 (3.88)	18.44 (3.83)	18.13 (3.63)	18.21 (3.74)	<0.001
Cigarette Dependence at baseline, M (SD)	48.10 (16.68)	42.88 (17.48)	43.55 (17.52)	44.08 (17.47)	0.005
Cigarette Smoking at 30-Day Follow-Up					
Days smoked in last month, d, M (SD)	18.41 (11.04)	15.79 (11.06)	16.61 (11.03)	16.69 (11.07)	<0.001
Cigarettes/day, M (SD)	8.47 (7.51)	6.48 (6.43)	7.08 (6.91)	7.15 (6.91)	<0.001
JUUL Use at 30-Day Follow-Up					
Days used JUUL last month, d, M (SD)	24.76 (7.95)	25.16 (7.43)	25.45 (7.15)	25.25 (7.37)	
JUUL Sessions/day, M (SD)	10.57 (11.74)	10.71 (12.08)	11.50 (12.84)	11.11 (12.45)	
Switching to JUUL (Past 30-day Smoking Abstinence)					
Switching at 60-day follow-up	1061 (39.80)	2753 (50.60)	4477 (47.90)	8291 (47.50)	<0.001
Switching at 90-day follow-up	1099 (42.70)	2815 (53.60)	4660 (51.70)	8574 (51.00)	<0.001
Switching at 180-day follow-up	881 (48.20)	2168 (58.50)	3632 (56.90)	6681 (56.10)	<0.001

Note. N=19,595. Denominators may be less than totals in column heads due to missing data. All values are presented as N (%) unless otherwise noted

Note: Consistent with applicable laws and regulations, JUUL Labs does not, and cannot, promote its products as being less harmful than cigarettes.